TOWARDS A PHILOSOPHY OF HUMAN TECHNOLOGY: OUTLOOK ON COGNITIVE ENHANCEMENTS IN AVATAR/ VIRTUAL REALITY SCHIZOPHRENIA THERAPY

Alexander Gerner

PHD in *History and Philosophy of Science* at the Faculty of Scicenes of the University of Lisbon, and Post-Doc FCT (CFCUL) http://cognitiveenhancement.weebly.com/ Head of the strategic research line Philosophy of Human Technology.
Email: amgerner@fc.ul.pt

RESUMO

This article hinges on a complex and interdisciplinary field of study named "Philosophy of Human Technology" in which a first non-exhaustive map of ethical, legal and social, technological issues is presented: Technologies constitute, magnify, amplify human experiences, but can also enslave or put human experience and life at risk for example what concerns the right to a "private Life". The second part of this paper proposes to think three possible interfaces of the topic of Human Cognitive Enhancement. Firstly the Body-electronic interface such as in the organ-on a chip simulation of an externalized human organ function, secondly the optogenetic and general genetic "editing" interface in which new technologies such as CRISPR/Cas9 open up questions for the future of human beings and our self-determination. Third -and more explicitly- the virtual-immersive interface, exemplified by cognitive enhancement by Avatar schizophrenia therapy and uncanny valley effects of digital body doubles will be introduced. The classic rubber-hand illusion had brought new insights into the plasticity of the body- image and the embodiment of the self, by underlining the strong influence of exteroception for the transformation of the bodily self. We will follow these thoughts on Avatar enhancements in schizophrenia therapy and scrutinize as well research ethical issues. Finally a short outlook on the question of two different types of technological detachment in tension in a Philosophy of Human Technology in which Cognitive Enhancement technologies are subjected to two types of technological detachments a) material/somatic substitution and b) detachment as a topos of independence and autonomy is hinted on.

PALAVRAS-CHAVE: Philosophy of Technology. Human Technology interfaces. Avatar schizophrenia therapy. Ethics of Cognitive Enhancement.

PARA UMA FILOSOFIA DA TECNOLOGIA HUMANA: PERSPECTIVAS SOBRE REALIZAÇÕES COGNITIVAS EM AVATAR / REALIDADE VIRTUAL ESQUIZOFRENIA TERAPIA

ABSTRACT
Este artigo cartografa um campo complexo e interdisciplinar de pesquisa chamado "Filosofia da tecnologia humana", para o qual um primeiro mapa não exaustivo de questões éticas, legais e sociais e tecnológicas é apresentado: tecnologias constituem, magnifiquem e ampliem as experiências humanas, mas também podem escravizar ou colocar a experiência humana e a vida em risco, por exemplo no que diz respeito ao direito de uma "vida privada". A segunda parte deste artigo propõe pensar três possíveis interfaces do debate do melhoramento cognitivo do humano. A primeira interface corporal-eletrônica, como no exemplo da simulação de órgão-num-chip que trata da exteriorização de uma função de um órgão humano, e por outro lado é introduzido a optogenética entre outras novas interfaces e ferramentas de intervenção genética, como o CRISPR / Cas9 que coloquem questões para a nossa autodeterminação e para a visão do futuro do ser humano. Em terceiro lugar focamos mesmo na interface virtual-imersiva que é exemplificada pela terapia da esquizofrenia por uso de duplos e Avatares e seus efeitos digitais. Já o clássico efeito de ilusão da mão - borracha nos trouxe novas perspectivas acerca da plasticidade da esquemática e imagem do nosso corpo e do si por uma forte influência tecnológica que seguiremos em melhoramentos cognitivos pelo uso de Avatares em terapia de esquizofrenia, e a qual é filosoficamente analisada, bem como em sua ética de investigação. Finalmente uma perspectiva sobre dois tipos diferentes de distanciamento tecnológico em tensão numa filosofia da tecnologia do humano no melhoramento cognitivo é lançado em relação a) a substituição somática-material e o b) ao desprendimento como um topos de independência e autonomia.

KEYWORDS: Filosofia da tecnologia. Interfaces tecnológicas humanas. terapia de esquizofrenia com ajuda de Avatares. ética do melhoramento cognitivo.

1 TOWARDS A PHILOSOPHY OF HUMAN TECHNOLOGY

A **Philosophy of Human Technology** should be aware of the present and future overspecialization of Technologies that influence the separation of a few direct powerful technological players and the many human beings that are affected by the technological developments inside complex growing self-conditioning productions of the techno-human condition (HÖRL, 2011). Technological transformations and changing infrastructures based on information in general, have become crucial for the welfare (CASTELLS; HIMANNEN, 2002), governance and inclusive growth (HAGSTROEM, 2015; DUTTA; GEIGER; LANVIN, 2015; BATISTA, 2003) as well as for security and freedom of societies themselves (DE SOLA POOL, 1984; critical cf. LYON, 2014), but as well as often have generated an extensive policy vacuum- for instance how to combine and implement the 2030 UN agenda 2030[1] for sustainable development with ICT´s or convergent technologies- and have created even more a vacuum of clarification of issues concerning the philosophical foundations of political, technical, ethical and juridical *frameworks* and *regulations* of present or upcoming aspects of individuals' existence, human rights, human dignity and plural collective interactions that *Philosophy of Human Technology* aims to face. The increasing interaction, convergence and interdisciplinarity of various scientific disciplines and technological fields calls for an permanent observational *map-making* of current developments in the field of Human Enhancement Technologies, Human-Machine Relations and Converging Technologies (Nano, Info-, Bio-, Cogno-science and technology) (ROCO; BAINBRIDGE, 2002; WOLBRING, 2008) with means derived from epistemological, strategic hermeneutical -besides quantitative and qualitative- approaches, by focusing on bioethical issues, human rights issues and their protection (cf. EST et al, 2014; ALBERS, 2014) mapping, anticipating and involving the public in relevant issues and values such as (a) Personal Identity and Identity-altering Technologies (in Human Enhancement and persuasive technologies (STRAND; KAISER, 2015), (b) Integrity and Transparency on algorithms that shape our lives (PRABHU, 2015; LANIER, 2013), (c) Dignity (FLORIDI, 2016), (d) Right to private Life (FINN et al, 2013), such as 1) Privacy of person encompassing the right to keep body functions and body characteristics, such as genetic

[1] "Transforming our world: the 2030 Agenda for Sustainable Development" http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E cf.: https://nacoesunidas.org/pos2015/agenda2030/

codes and biometrics, and Integrity of a person's body[2] 2) Privacy of personal behavior and action (NIESSENBAUM, 2010) 3) privacy of personal data and image, that may even lie outside the individuals control e.g. in the case of "Neurodata" (HALLINAN et al, 2014) 4) privacy of personal, non-intercepted communications 5) privacy of thoughts and feelings 6) privacy of location and space 7) privacy of association (including group privacy) or 8) privacy of personal experience (CLARKE, 1997, 2014) inside either autonomous or heteronomous modulation of control in relation to Big data, "dividuals" (DELEUZE, 1992), body "data doubles" and surveillance (LYON, 2014), often it seems we have to be able to-say-no, disconnect or enter a syncope (Nancy) of too much resonance, that aims to determine us. Hereby more questions arise about (e) Cognitive Liberty (SENTENTIA, 2004; BUBLITZ; MERKEL, 2014) and Freedom of Thought (BUBLITZ, 2015) and action, as well as human self-determination and autonomy (f) Safety issues, (g) Equitable Access/ Technological Inclusion or (h) Justice and state of law issues and (i) human self-definition, self-image and future (strategic) visions of being human, societies and their values. These complex issues in Philosophy of Human Technology call for a scrutinizing of emerging technologies in their transformative potential for human beings, life and human fundamental rights and freedoms, in the sense of Responsible Research and Innovation (RRI) in the spirit of the *Declaration of ROME* on RRI (2014) and an amplification of the OVIEDO Convention (1997) of Human Rights -not only with regard to the Application of Biology and Medicine as fields challenging human fundamental rights and liberties, but also to take into account other techno- and data-intensive sciences and the technological transformations given in convergent and emergent technologies. What could be sustainable, desirable and acceptable innovations, and how are answers to this question linked to what with GRUNWALD (2013b) can be called the challenges of *Techno-Visionary Sciences* that urge us to reflect not only *post-factum* on the concrete/factual level of existing technologies, but *ante-factum* on the possible, thinkable or even only imaginable consequences of new emerging or converging technologies.

This is the case-for instance- in so called "human cognitive enhancement"- to which the interdisciplinary cognitive enhancement (HILDT; FRANKE, 2013; BLANK, 2016) debate

[2] Bodily privacy according to Finn et al (2013, p.6) "(…) would include protection against physical intrusions, including torture, medical treatment, the "compulsory provision of samples of body fluids and body tissue" and imperatives to submit to biometric measurements"

belongs- and designing/making human beings or extreme extension of life-span, or the supposed event of (nonhuman) "super-intelligence", pervasive (and wireless) direct *brain-to-brain* communication/manipulation, or *ideological* teleology - accounts of human beings such as normative, and even esoteric visions of "pos-humanity" or/and "mind uploading" (cf. critically AGAR, 2009), "brain emulation" scenarios (BOSTROM, 2014), reanimating of EEG-dead brains by stem cell peptide injections (SANDBERG, 2016), or implanting of the human brain onto a robotic entity (e.g. "Humai") as "transcending the human body by robotics" (HUMAITECH, 2016).

2 THREE *POSSIBLE* INTERFACES OF A PHILOSOPHY OF HUMAN COGNITIVE ENHANCEMENT

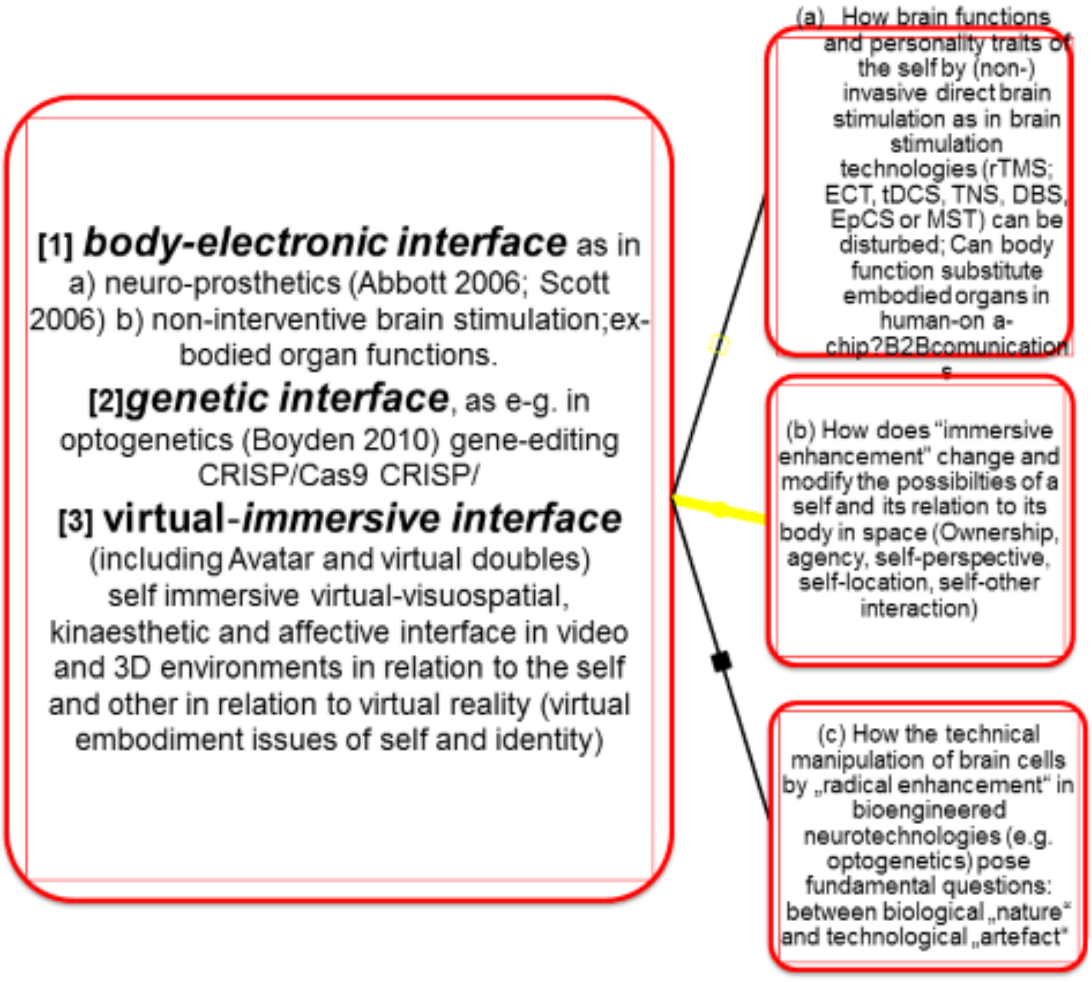


Diagram: Three possible interfaces of Human Cognitive Enhancement

Conceiving a common framework of the weighing processes of evaluating Cognitive enhancement for an epistemology and a philosophy of technology emerging from Cognitive Enhancement, relating biomedical questions with technological tools, comparing enhancing processes in invasive, non-invasive modes in relation to disorders and the healthy I concentrate on three interfaces (that for mere limitation of this article now leaves out for instance pharmacological enhancement methods): (1) the bodily (Neurophysiologic and bio)-electronic (2) the bio-genetic interface for example in „genetic" manipulation of brain cells or „radical enhancement" (AGAR, 2009) methods by interfering into the make-up of cells in bioengineered neurotechnologies e.g. optogenetics or by tools as CRISPR/Cas 9 (3) and the virtual-immersive interface.

New problems arise defining us as human persons coming up from [I] body (neuro)electronic interface such as in (1) *brain to brain interfacing* (see: HILDT, 2015), (2) *neural grafting*, *neuro-prosthetics* as transplants/implants with electronic, cellular, genetic or molecular types (e.g. cell replacement therapies such as in Parkinson) and [II] the genetic interface such as in (3) *genomic repair*, e.g. in „genome surgery" (REICH et al, 2015) and that prospectively evaluate futures of humanity in relation to (4) genomic „editing" in which Human germ-line modifications and the technical non-expansive possibility of genome transformation technologies (CRISPR/Cat9, TALENs, ZFNs) redraw the ethical threshold not between somatic vs. germ-line modifications but between gene *repair* to gene *enhancements*. How do optogenetic (a) *control mechanisms*, (b) cybernetic *big data collections*, (c) *biomarkers prevision* and consequently (d) *genetic testing* and (e) *gene-editing* open up possibilities to induce not only certain social behaviors by contextualized, Enhancements", but also change our self-concepts and *imago humano* and question Personhood, Self, embodied social and intersubjective beings and the other-self relations?

Hagener e Hoerl (2008) oppose the ***organicistic perspective*** to the since then rising position of a ***technicistic-cybernetic point of view*** (though I think that both can still be seen as operational and even more converging in what today can be confirmed in the human enhancement technologies and the ethical debates parallel to them, e.g. in the gene-editing debate on genomic, editing" such as the technologies of CRISP/Cas9 (LIANG et al, 2015; BARRANGOU, 2015; CONG, 2013), or CRISP/ Cpf1 (LEDFORD, 2015; ZETSCHE et al, 2015), TALENs (DING et al, 2013), ZFNs (CHEN ;GONÇALVES, 2016; URNOV et al, 2010)

or even "error reduction" in CRISPRmodified human embryonic cells that might permit „the functional testing of regulatory factors essential to development" (GENE NEWS HIGHLIGHT, 2016) and that was approved in 2016 by the Human Fertilisation and Embryology Authority (HFEA), a U.K. regulatory body. Will we in the future identify ourselves- from an organicistic and technicistic-cybernetic view of the technohuman condition- with "*pre-edited bodies"* and thus the interface dissolve and slip into the "technological unconscious" (NEYRAT, 2011).

2.1 On The Body-Electronic Interface: The Externalized Function

Curious is a technological inversion of the Deleuzian& Guattarian concept of *Bodies without Organs* (DELEUZE; GUATTARI, 1987) put on the plane of immanence of an ***algorithmic body double*** that is named "organs-on a chip"(REARDON, 2015) but could be called ***"exbodied organ function without a (whole) body"*** for the sake of pharmacological test trials of drugs: The algorithmic double as organs without a body e.g. introduces organ-on-a-chip - microchips, lined up with microfluidic human cells, simulating its activities, kinetic mechanics, and physiological response of entire organs (and their interfunctionality)- as technological mimicking the effectors of test drugs on the *virtual patient* (LANGE, 2010) and their translational effectiveness on real human organs. Besides *Lung-on-a-chip*, already *liver-on-a-chip, gut-on-a-chip, heart-on-a chip* and *bone-on-a-chip* have been developed and put into a computational network to approximate the ideal of a digital double or ***Human-on-a-chip*** heading to understand not average but population and individual expressions of drugs and their effectors in order to develop in the long run a personalized/stratified medicine simulation of individuals drug response. Other new technologies such as *Optogenetics* (BOYDON, 2010), that has been applied in 2016 for the first time on human test trials in somatic (but still not in the human genome nor brain) cells in the field of recovery of vision research, the treatment of "retinitis pigments" a degenerative retina cells disease (BOURZAC, 2016), raise questions on the status of life forms in between biological, nature" and technological artefact, for example in the optogenetically controlled the cardiac organ function (ARRENBERG et al ,2010).

Optogenetics is a light-control mechanism and an example of genetic ***hybridization*** (HUBIG, 2015). Hubig sees the problem in the qualitative change of human selfhybridization as disappearance of the consciously definable, knowable and shapable interface that result in its technological co-action with human beings. If interfaces become unclear, dissolved, escape

the possibility of being shaped, the technology seems to become, autonomous“ in analogy to human beings. Therefore the new technology of Optogenetics raises questions on the status of life forms in between biological, nature“ and technological artefact.

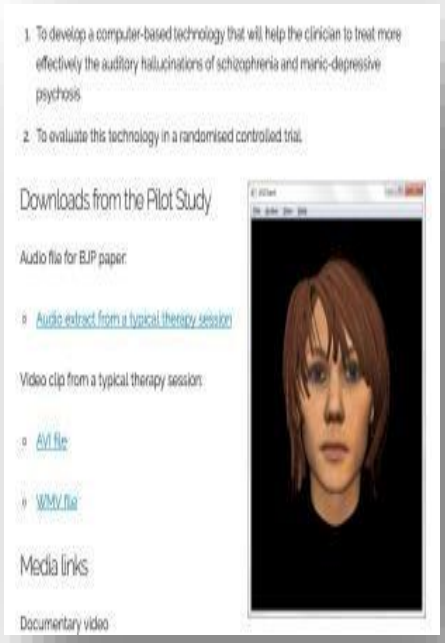
What types of gene-editing research are ethical and which should not be followed? How do Repair, Rehearsing and (Re-) editing for instance on the neural and the genetic level contributes to Human Futures, and who decides them? What new relations of power and what kind of variables in technology *as consequences of decisions taken* (BAEKER, 2011) are given, and what intergenerational responsibility shifts on the “decentness of a children´s own future”- with degrees of openness in handle amounts of degrees of freedom- is proposed in these new technologies, and who decides on whose future and on which behalf?

Parents, as guardians of children’s interests? Are laws, regulations and welfare systems acting as protectors and defenders and guarantee of the interests of (future) citizens? This means: how far do human enhancement visions such as genetic transformations first of all require *politics*- understood as negotiation and agreement upon shared forms of life- as well as philosophy” (SPARROW, 2012, p. 367)? For GRUNWALD (2013) human enhancement can be seen as an expression of our societal forces of increasing competition and coercion that has been critically monitored.

3 TOWARDS A PHILOSOPHY OF VIRTUALITY AND AVATAR-BASED COGNITIVE ENHANCEMENT IN AVATAR AND IMMERSIVE SCHIZOPHRENIA THERAPY

Pharmacological efficacy in schizophrenia therapy has limitations as one of four patients fail to respond to treatment with anti-psychotics (KANE, 2007). Schizophrenia is best analysed as alienation of its own body, a disembodiment. Disturbances of embodiment may be classified with FUCHS & SCHLIMME (2009) in two fundamental categories: (1) primarily affecting the subject body, prereflective embodied sense of self (2) being related to the bodyimage, the explicit body awareness. This approach introduces –for now only hypothetically- modifications in the plasticity of both notions of the self in embodiment and self-other relation by Avatar-self interactions. Selves can be socially embedded or exbodied by self-technologies introducing change by Avatar-self technology. Therefore psychosomatic wellbeing of the patients is

enhanced in Integrative Avatar schizophrenia Therapies by computer assisted schizophrenia therapy (LEFF et al, 2013, CRAIG et al, 2015)



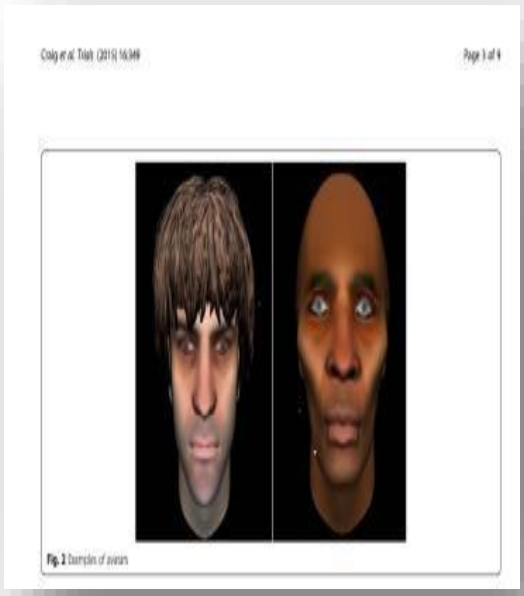


IMAGE 1 (left): screenshot taken from Leff, Huckville, Williams, Avatar Therapy site: http://www.phon.ucl.ac.uk/project/avtherapy/

IMAGE 2 (right): screenshot of CRAIG et al 2015: "Examples of Avatars" http://trialsjournal.biomedcentral.com/articles/10.1186/s13063-015-0888-6

I propose a framework of self-formation and self-development in pro-social behavior and embodied intercorporality in which I apply joint issues in the philosophy of psychiatry/medicine/health and philosophy of human technology in relation to Computer Assisted Schizophrenia Therapy using Avatars/ and Virtual Reality immersion as technical tools and as an example for *VR cognitive enhancements* of self-other relations e.g. of the schizophrenic patients with the help of Avatar doubles. The virtual reality immersion is key to *body-ownership attribution and transformation in Avatar studies* (SLATER et al., 2009, 2010) in relation to an embodied body presence in space: "the power of immersive virtual reality (IVR) to produce radical transformations in body ownership" (SLATER et al., 2010).

Virtual Reality (VR) applications besides VR in behavioral therapy, is important for so called VR analgesia (HÄNSEL et al, 2011). Avatar interactions in Virtual worlds can transform patients perception of their illness and give them a technical doubeling tools at hand for a betterment by *technologies of a projective self*. One point that enhances the possibility of perspective taking is given in ***body schema transformations by introducing schizophrenic self modeled Avatars.*** Already in the classical rubber-hand-illusion (RHI) (BOTVINICK; COHEN, 1998) the reintegration of external artifacts (a rubber hand on the table) as part of the body schema while synchronically stimulating the hand and the visual rubber hand has brought new insights in the plasticity of the body image and the embodiment of self by a strong influence of exteroception that we will follow in Avatar enhancements in schizophrenia therapy.

RHI is an illusion in the coordination of vision, touch, and posture (proprioception), another form would be the coordination of touch and proprioception (EHRSSON et al, 2005, 2007) that have to be considered as reasons why LEFF et al (2013) and GRAIG et al /2015) Avatar selfdouble enhancement therapy can be successful: According to Thomas JAMIESON-CRAIG (2013), Avatar Therapy helps silencing strange voices in schizophrenic patients at least diminishes the frequency of the uncanny reappearance of "hearing voices".

3.1 On The Uncanny Valley, Proteus Effect And Human Factors

Besides issues of (I) immersiveness/self-other relations and ethical questions in Virtual Reality/Avatar Enhancements one has to consider (II) *human factors* (III) *proteus effect* (cf. YEE; BAILENSEN, 2007), the (IV) adaptation as well as differentiation from the virtual avatar, and different forms of engagement with it (assuming different bodies) in Avatar studies and a ditrimental effect of human likeness that flips at a certain threshold into uncanny feelings of aversion against human-like objects (including corpses, prosthetic hands) as hyperphenomenal (WALDENFELS, 2012) and artificial (yet not technical) objects as in the (V) *uncanny valley*[3]

[3] In what TINWELL et al (2013) in modulation of the roboticist Mori´s uncanny valley call „uncanny wall" perceived familiarity/human likeness and empathetic likeability towards virtual characters depends on more variables than only (a) *appearance* and the VR characters (b) *behavior* such as, but as well on the (c) *habituation* effects (MINATO et al, 2004), as well as (d) *contingent motion* (e) *involuntary waving motion* (MIHASHITA; ISHIGURO, 2004) (f) *eye contact and shared attention* (g) the *time factor* in *discernment* (TINWELL et al, 2013) *of technical trickery* and its recognition as well as the modulators underlined by (SLOTOVSKY et al, 2015), namely (h) *repetitivity of interaction* and (i) positive *attitude of the artifical agent* (less uncanny valley effect) or *negative* attitude of the artifical agent (stronger uncanny valley effect).

effect (MORI, 1970; CHEETHAM; JANCKE, 2013) that has to be considered in difference to (VI) *autonomous computer-controlled agents*, as the „mere perception of humanity in a digital representation can be powerful enough to amplify social responses within virtual environments." (FOX ET AL, upcoming)? Amplifying Leffs paradigm in providing different levels and methods of immersion one parameter has to be *the degree of visuo-spatial similitude of the Avatar and the patient´s proteus effect* (YEE; BAILENSEN, 2007), the adaptation as well as differentiation from the virtual avatar, and different forms of engagement with it, so that, (y)our digital doppelgänger in a virtual world can change how you behave in the real world." (FOX; BAILENSON, 2009).

Avatar self-double enhancement therapy can be successful. In which sense is the schizophrenic self possible to be influenced or "enhanced" by *distracting techniques* for instance the distraction of the actual somatic body image and body-ownership given in its necessary multisensory synchronizations and de-synchronizations (BANAKOU; SLATER, 2014) and sensory motor embodiment. What has to be taken into account is as well the delayed, anticipated or desynchronized temporality of somatic self-perception and interaction of different levels of bodily sensory-motor coordination or its unitary disruptions of ownership and self-perception, such as in creating *phantoms* for instance by temporal self-anticipation or (VI) *prolepsis* - Sich-vorweg-Sein" (RIEGER, 2014) - in which oneself temporally is *anticipated* from actuality of the presence of one´s actual somatic body into the potentiality of future virtual bodies. How important, we should as well ask is *empathy* for self-other interaction and transformation in VR (FUCHS, 2014)?

How we use this empathy or the uncanniness towards them is, however an open field of research for deciding the future of human relations to technological artefacts, that further research will have to deal with. Thus another question of interest is related to a) the *initiation of* b) *doubling of* and c) *interaction with* **non-identical body doubles and phantoms**, and how these influence performative and interactive gesture-based praxis and our embodied participation with others inside social cognitive interaction.

3.2 "Changing Us In Turn" -The Virtual-*Immersive Interface: Outlook On Ethical And Policy Issues*

> *"We think of avatars as things of our own creation, digital clay that can be endlessly shaped. But avatar creation is actually a two-way process. The fact is that our avatars change us in turn"* (YEE, 2014, p. 152).

Every encounter is based on capacities to switch between your own embodied perspective and the perspective of others and at the same time to distinguish both perspectives to assert yourself in front of the other.

CAST envisions, we technically inhabit and alter our own embodied "Avatar" of self, enhancing the distinction between me and an exbodied schizophrenic Avatar. If Enhancement is defined as part of human techniques, which include the development and progress in medicine and not just "Enhancement Uses of Medical Technology", pharmacology, longevity, self-formation, self-training and excercise (such as meditation) as well as medical healing, social, personal and bodily wellbeing and quality of life, methodological advances and progress in treatment of deficitary states of the embodied mind, we can speak of an *Enhancement* as intrinsic and not as deviant from medicine. Ethical, epistemological and techno-philosophical as well as policy questions become relevant for example in new AVATAR and VR technologies: Do "exbodied" gesture based (MITTELBERG, 2013) and enactive self-Avatar interactions in Virtual worlds enhance patients perception of their illness and give them technological tools at hand for a betterment as by *technologies of a projective self*, or do these doubleing strategies of the body foster normalization of plural, poly(ec)centric positionalities" (GUALENI, 2015; PLESSNER, 1975[1928]), by hallucinations and illusions made more real by exbodiment and in a virtual encounter with the schizophrenic Avatar double/phantom?

How does the induction of enhanced social behavior- e.g. by virtual reality means-question Personhood, Self, and the Other-Self relation anew, and in which sense is Avatar and Virtual Reality augmentation (using for instance *illusions of embodiments and their lasting effects* -and together with converging *techno-visionary sciences* in need of clear *ethical rules of good scientific practice* (MADARY; METZINGER, 2016) taking into account the ethics of long-term immersion, neglect of others and the physical environment as well as privacy issues and risky content that may pose actual and future policy questions (BLANK, 2013, 2016).

4 COGNITIVE ENHANCEMENTS IN BETWEEN TWO TYPES OF TECHNOLOGICAL DETACHMENT

Is the make-up and "Gestalt" of men and machines generally inseparable in a notion of the prothetic character (cf. YEE (2014); Yee e Bailenson (2007)) as integral part of our biological make-up, as Hoerl e Hagener (2008, p.9) propose in one among many possible hypotheses of man-machine relations? As Neyrat (2011) rightly noted in relation to Gotthard Günther's (2002) text on the "second machine", technology and specifically in relation to the immersive interface can be viewed as a **double *de*tachment**: **[1]** a ***material detachment*** in a *hyletic* sense, in which organic material is confronted with a ***material substitution***, as "artificial" bodies *still not rendered technically operational* detaching from somatic entities, through virtual entities such as

Avatars. In this scenario what is given is a substitute for pre-given "natural" hylomorphologic means in its material substrate- and thus a material ***substitution***[4] of the hylomorphic schema by a hypothetical *pure technical body double*, that would restitute or "optimize" among others the materiality of the somatic body by a pure organologic functionality made operational. **[2]** detachment- from a subjectivation point of view- also means a growing ***independence*** in the transition from a ***handled tool*** (controlled and governed/steered from outside) to a ***operated machine*** (autonomous self-controlled and self-governed). In this *second type of detachment*, a *becoming of independence of (self-) autonomous form* from the agent, who before handled and controlled the tool, is given. Both moments have to be considered and weighed in debates on Human Technologies and in what kind of being we want to transform ourselves - or not!- in the future.

[4] This perspective is put forward for example by the idea of SCHELSKY (1961) that sees an unavoidable and thus anthropologically necessary power-driven take-over of human existence, socially and individually by an anonymous technocratic "Leviathan", or an "universal technical body" that fosters the technological doubling or "re-"creation of human beings. Cf. HAGENER 2008, 62ff; cf. critical to SCHELSKY´s position: (HABERMAS, 1968).

REFERENCES

AGAR, N. *Humanities End*. Why we should reject radical Enhancement. Cambridge Mass: MIT Press, 2009.

ALBERS, M. Enhancement, Human Nature, and Human Rights, in: ALBERS, Marion et al (eds.) *Human Rights and Human Nature*. Heidelberg: Springer, 2014.

ARRENBERG, A. et al. Optogenetic control of cardiac function. *Science*, v. 330, p. 971–974, 2010.

BAEKER, D. Technik und Entscheidung. In: HÖRL, Ernst (ed.). *Die technologische Bedingung*. Berlin: Suhrkamp, 2011.

BARRANGOU, R. et al. Advances in CRISPR-Cas9 genome engineering: lessons learned from RNA interference. *Nucleic Acids Research*, v. 43, n. 7, p. 3407–3419, 2015.

BATISTA, C. *ICTs and Good Governance:* The Contribution of Information and Communication Technologies to Local Governance in Latin Americ: (UNESCO), 2003. Disponível em:< http://portal.unesco.org/ci/en/files/11316/10547335250Report_on_egovernance_in_Latin_America.pdf/Report%2Bon%2Begovernance%2Bin%2BLatin%2BAmerica.pdf>. Acesso em: 24 de mar. 2015.

BLANK, R. *Intervention in the Brain*. Cambridge Mass.: MIT Press, 2013.

_____, *Cognitive Enhancement*. Social and Public Policy Issues. Hampshire: Palgrave Macmillan, 2016.

BLUMENBERG, H. Einige Schwierigkeiten eine Geistesgeschichte der Technik zu schreiben. In: BLUMENBERG, Hans. Schriften der Technik. SCHMITZ, Alexander, STIEGLER, Bernd (eds.). Berlin: Suhrkamp, 2015.

BOSTROM, N. *The Transhumanist FAQ. A General Introduction*. Version 2.1/2003. Disponível em:< http://www.nickbostrom.com/views/transhumanist.pdf>. Acesso em: 13 de fev. 2016.

_____. *Superintelligence*. Paths, Strategies, Dangers. Oxford: Oxford University Press: 2014. BOTVINICK, Matthew, COHEN, Jonathan Rubber hand 'feel' touch that eyes can see. *Nature* v. 391, p. 756, 1998.

BOYDEN, Edward. A history of optogenetics: The development of tools for controlling brain circuits with light. *F1000 Biology Reports*, v.3, n.11, 2011, B3-11.

BOURZAC, K. Texas Woman is the first to undergo optogenetic therapy. *MIT Technology Review*, March 18th, 2016. Disponível em: https://www.technologyreview.com/s/601067/texaswoman-is-the-first-person-to-undergo-optogenetic-therapy/#/set/id/601069/. Acesso em: 26 de mar. 2016.

BUBLITZ, C. Cognitive Liberty or the international Human Right to Freedom of Thought. In: CLAUSEN, Jens and LEVY, Neil (eds). *Handbook of Neuroethics*. Dordrecht: Springer Science, Buisness Media, 2015.

CALLAWAY, E. Second Chinese team reports gene editing in human embryos .Study used CRISPR technology to introduce HIV-resistance mutation into embryos. *Nature* 8th of April 2016a, doi:10.1038/nature.2016.19718. Disponível em: <http://www.nature.com/news/second-chineseteam-reports-gene-editing-in-human-

embryos-1.19718>. Acesso em: 22 de abr. 2016.

_____, UK scientists gain licence to edit genes in human embryos; *Nature*, v. 530, n. 18, 2016. Disponível em:< doi:10.1038/nature.2016.19270>. Acesso em: 6 de Março.2016.

CASTELLS, M.; HIMANNEN, P. *The Information Society and the Welfare State*: The Finnish Model. Oxford: Oxford University Press, 2002.

CHEETHAM, M. ; JANCKE, L. Perceptual and Category Processing of the Uncanny Valley Hypothesis' Dimension of Human Likeness: Some Methodological Issues," *J Vis Exp v. 76*, 2013.

CHEN, X.; GONÇALVES, M. Engineered Viruses as Genome Editing Devices. *Molecular Therapy*, v. 24, n.3, p. 447-457, 2010.

CLARKE, R. Privacy and Social Media: An analytical framework. *Journal of Law and Information Science, v.* 15, p.1-23, 2014.

_____. *Introduction to Dataveillence and Information Privacy, and Definition of Terms*. Disponível em:< http://www.rogerclarke.com/DV/Intro.html>. Acesso em: 7 de mar. 2016.

CONG, L. et al. "Multiplex Genome Engineering Using CRISPR/Cas Systems" *Science*, v. 339, n. 6121, p. 819-823, 2013.

COUNCIL OF EUROPE, General Data Protection Regulation (*8th* of April 2016). Disponível em:< http://eur-lex.europa.eu/legalcontent/EN/TXT/PDF/?uri=CELEX:52016AG0006(01)&from=EN>. Acesso em: 10 de mai. 2016.

CRAIG, T. et al. The effects of an Audio Visual Assisted Therapy Aid for Refractory auditory hallucinations (AVATAR therapy): study protocol for a randomised controlled trial. *Trials* v.16, n.349, 2015.

CYRANOSKI, D.; REARDON, S. Chinese scientists genetically modify human embryos. *Nature News*. 22. April 2015. Disponivel em:<http://www.nature.com/news/chinese-scientistsgenetically-modify-human-embryos-1.17378 >. Acesso em: 10 de mai. 2016.

DING, Q. et al. A TALEN genome-editing system for generating human stem cell-based disease models. *Cell Stem Cell.* v.12, p. 238–251, 2013.

DELEUZE, G.; GUTARRI, F. *A thousand Plateaus*. Capitalism and Schizophrenia. Translation and Foreword by Brian Massumi. Mineapolis: University of Minnesota Press 1987-1980.

DELEUZE, G. Postscript on the Societies of Control. *October* v. 59, p. 3-7. In: DE SOLA POOL, I. *Technologies of Freedom*. Cambridge Mass.& London: Belknap Press of Harvard University Press, 1984.

DUTTA, S.; GEIGER, T.; LANVIN, B. (eds.). *The Global Information Technology Report 2015*. ICTs for Inclusive Growth 2015, Geneva: WORLD ECONOMIC FORUM & INSEAD, 2015.

EHRSSON, H. et al. Touching a Rubber Hand: feeling of body ownership is associated with activity in multisensory brain areas, *J Neurosci*, v. 25 ,n. 45, p. 10564-10573, 2005.

EHRSSON, H. The experimental induction of out-of body experiences. *Science*, v. 317, p. 1048. 2007.

EST, Renie van et al. From Bio to NBIC convergence- From medical Practice to Daily Life. Report written for the Council of Europe, Committee of Bioethics. *Rathenau Instituut, Report* 2014. Disponível em: <https://rm.coe.int/CoERMPublicCommonSearchServices/DisplayDCTMContent?documentId=0 900001680307575>. Acesso: 12 de nov. 2015.

FINN, R. et al. Seven types of privacy. In: GUTHWIRT, Serge et al. (eds). *European data protection*: coming of age. Dordrecht: Springer, 2013.

FLORIDI, L. On Human Dignity as a Foundation for the Right to Privacy. *Digital Life*, 6 de Maio 2016. Disponível em:< http://www.chefuturo.it/2016/05/dignity-foundation-right-to-privacy/>. Acesso em: 16 de mai. 2016.

FOX, J. BAILENSON, Jeremy. Virtual Self-Modeling: The Effects of Vicarious Reinforcement and Identification on Exercise Behaviors. *Media Psychology*, v.12, p. 1–25, 2009.

FUCHS, T. The Virtual Other. Empathy in the Age of Virtuality. *Journal of Consciousness Studies*, v.21, n. 5-6, p.152-173, 2014.

_____; SCHLIMME, J.. Embodiment and psychopathology: a phenomenological perspective. *Current Opinion in Psychiatry*,v. 22, 2009.

GEN NEWS HIGHLIGHT, CRISPR editing of human embryos approved in the UK. Accessivel em:http://www.genengnews.com/gen-news-highlights/crispr-editing-of-human-embryosapproved-in-the-u-k/81252308/. Acesso em: 24 abr. 2016

GRUNWALD, A. Techno-Visionary Sciences. Challenges to Policy Advice". *Science, Technology & Innovation Studies, vol 9, n. 2*, 21-38, 2013b.

_____. Are we heading towards an 'Enhancement society'? In: HILDT, Elisabeth, FRANKE, Andreas (eds.). *Cognitive Enhancement*. An interdisciplinary perspective. Dordrecht: Springer Science, Buisness Media, 2013.

GUALENI, S. *Virtual Worlds as philosophical Tools*. How to philosophize with a digital hammer. London: Palgrave, 2015

GÜNTHER, G. (2002[1952/7]). "Die >zweite< Machine," in: Gotthard Günther. Das Bewußtsein der Maschinen. *Eine Metaphysik der Kybernetik*. Baden Baden, 205-227.

HABERMAS, J. *Technik und Wissenschaft als Ideologie*: Frankfurt: Suhrkamp, 1968.

HAGENER, M. "Vom Aufstieg und Fall der Kybernetik als Universalwissenschaft,"in: HÖRL, Ernst, HAGENER, Michael (eds.). *Die Transformation des Humanen*. Beiträge zur Kulturgeschichte der Kybernetik. (=svt 1848). Frankfurt: Suhrkamp, 2008.

HAGSTROEM, M. Big Data Analytics for Inclusive Growth: How Technology Can Help

Elevate the Human Condition. In: DUTTA, Soumitra, GEIGER, Thierry, LANVIN, Bruno

(eds.). *The Global Information Technology Report 2015*. ICTs for Inclusive Growth 2015, Geneva: WORLD ECONOMIC FORUM & INSEAD, 2015.

HALLINAN, D. et al. Neurodata and Neuroprivacy: Data Protection Outdated? *Surveillance & Society*, v.12, n.1, 2014.

HÄNSELL, A. et al. Seeing and identifying with a virtual body decreases pain perception. *European journal of pain*, v. 15, n. 8, p. 874-879, 2011.

HARRASSER, K. *Körper 2.0*. Über die technische Erweiterbarkeit des Menschen. Bielefeld: transcript, 2013.

HÖRL, E.; HAGENER, M. (eds). „Überlegungen zur kybernetischen Transformation des Humanen". In: HÖRL, Ernst, HAGENER, Michael (eds.). *Die Transformation des Humanen*. Beiträge zur Kulturgeschichte der Kybernetik. (=svt 1848). Frankfurt: Suhrkamp, 2008.

HÖRL, E. Die technologische Bedingung. Einleitung. In: HÖRL, Ernst (ed.). *Die technologische Bedingung*. Berlin: Suhrkamp, 2011.

HILDT, E., What will this do to me and my brain? Ethical issues in brain-to-brain interfacing" *Front Syst Neurosci.*, v. 9 n. 17, 2015.

_____. FRANKE, A. (eds.). *Cognitive Enhancement*. An interdisciplinary perspective. Dordrecht: Springer Science, Buisness Media, 2013.

HUBIG, C. *Die Kunst des Möglichen III*. Macht der Technik. Bielefeld: Transcript, 2015.

KANE, J. Treatment resistant schizophrenic patients. *J Clin Psychol*, v. 57, suppl. 9, 2007.

LANIER, J. *Who Owns the Future*. New York: Simon & Schuster, 2013.

LANGE, S. Der virtuelle Patient. Systembiologie ist die Chance für die individuelle Medizin. In: *GENOMEXPRESS*, v. 1, n.10, 2010.

LANPHIER, E. et al."Don´t edit the human germ line" *Nature v. 519*, p. 410–41, 2015.

LEDFORD, H. Alternative CRISPR system could improve genome editing. *Nature*, v. 526, n. 17, 2015.

LIANG, P. et al. CRISPR/Cas9-mediated gene editing in human tripronuclear zygotes, *Protein & Cell*, v. 6, n. 5, p.363-372, 2015.

LYON, D. Surveillance, Snowdon, and Big Data: Capacities, consequences, critique. *Big Data & Society*, July-December 2014.

MADARY & METZINGER, Real Virtuality: A Code of ethical Conduct. Recommendations for Good Scientific Practice and the Consumers of VR Technology, *Frontiers in Robotics and AI*, Vol3, art.3, 2016.

MAZZOLA, G; Park, J; Thalman, F. *Musical Creativity. Strategies and Tools in Composition and Improvisation*. Springer, 2011.

MIYASHITA, T.; ISHIGURO, H. Human-like Natural Behavior Generation based on involuntary motions for Humanoid Robots, *Robot Auton Syst*, vol. 48,n. 4, p. 203-212, 2004.

MINATO, T. et al. Development of an android robot for studying human-robot interaction. In: *International Conference on Industrial, Engineering and Other Applications of Applied Intelligent Systems*. Springer Berlin Heidelberg, 2004.

MORI, Masahiro. The uncanny valley. *Energy, v.7*, p. 33–35, 2005.

NEYRAT, F. Das technologische Unbewußte. Elemente einer Deprogrammierung. In: Erich Hoerl (ed). Die technologische Bedingung. Beiträge zur Beschreibung der technischen Welt (=swt 2003). Berlin: SUHRKAMP, 2011.

NIESSENBAUM, H. *Privacy in Context*: Technology, Policy and the Integrity of Social Life. Stanford: Stanford University Press, 2009.

OVIEDO. Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine: Convention on Human Rights and Biomedicine, Oviedo, 4.IV, 1997. Disponível em: https://rm.coe.int/CoERMPublicCommonSearchServices/DisplayDCTMContent?documentId=09 0000168007cf98. Acessado em: 2 de Março 2016.

PLESSNER, Ht. *Die Stufen des Organischen und der Mensch.* Einleitung in die philosophische Anthropologie. Berlin/New York: Walter de Gryter, 1975[1928].

PRABHU, R. How Should We Govern the Algorithms that Shape Our Lives? In: Scherz, Constanze et al (eds.) *The Next Horizon of Technology Assessment*. Prague: PACITA, 2015.

REARDON, S. 'Organs-on-chips' go mainstream. Drug companies put in vitro systems through their paces.“ *Nature*, v. 523, 2015.

REICH, J. et al. Human Genome Surgery – Towards a responsible evaluation of a new Technology. *ANALYSIS BY THE INTERDISCIPLINARY RESEARCH GROUP Gene Technology Report*. Berlin: BERLIN BRANDENBURGISCHE AKADEMIE DER WISSENSCHAFTEN, 2015.

RIEGER, S. Menschensteuerung. Zu einer Wissensgeschichte der Virtualität. JESCHKE, Sabina et al. (eds). *Exploring Virtuality. Virtualität im interdisciplinären Diskurs*.Wiesbaden: Springer Spektrum, 2014.

ROCO, Michael, BAINBRIDGE, William. *Converging Technologies for Improving Human Performance*, Arlington: WTEC, 2002.

ROME DECLARATION on Responsible Research and Innovation in Europe. Disponível em: <https://ec.europa.eu/research/swafs/pdf/rome_declaration_RRI_final_21_November.pdf>. Acesso em: 13 de Abr. 2016.

SANDBERG, A. ; BOSTRÖM, N. *Whole Brain Emulation. A Roadmap Technical Report* #20083“. Disponível em: < http://www.fhi.ox.ac.uk/brain-emulation-roadmap-report.pdf>. Acesso em: 23 de fev. 2016.

SANDBERG, A. Would We Want To Regenerate Brains Of Patients Who Are Clinically Dead? *IFL Science*, 11 de Março 2016. Accessivel em:<http://www.iflscience.com/brain/would-wewant-regenerate-brains-patients-who-are-clinically-dead>. Acesso em: 13 de Abr. 2016.

SCHELSKY, H.. *Der Mensch in der wissenschaftlichen Zivilisation*. Köln/Opladen: Westdeutscher Verlag, 1961.

SEARLE, J. "What your computer can´t know" The New York Review of Books, 9th of Oct. 2014. Disponível em:<http://www.nybooks.com/articles/archives/2014/oct/09/what-yourcomputer-cant-know/ >. Acesso em: 18 de mai. 2015.

SENTENTIA, W. Neuroethical Considerations: Cognitive Liberty and

Converging Technologies for Improving Human Cognition. *Annals of the New York Academy of Sciences*, v. 1013, 2004.

SLATER, M. et al. How we experience immersive virtual environments: the concept of presence and its measurement. *Anuario de Psicología,* v.40, n. 2, 2009.

_____. "First person Experience of Body transfer in virtual reality" *PLoS ONE* v.5, n.5, e10564, 2010. Disponível em: doi:10.1371/ journal.pone.0010564. Acesso em: 23 de Mar. 2014.

SLOTOVSKY, J. et al. Persistence of the uncanny valley: the influence of repeated interactions and a robot's attitude on its perception *Front. Psychol*., v.6, p. 883, 2015.

SOFOULIS, Z. Post-, Nicht-, Parahuman. Ein Beitrag zu einer soziotechnischen Personalität. In: ANGERER, Marieluise, PETERS, Katrin, SOFOULIS, Zoe (eds.). *Future Bodies.* Zur Visualisierung von Körpern in Science and Fiktion. Wien/ New York: Springer: 2002.

SPARROW, R. A child´s right to a decent future? Regulating human genetic enhancement in multicultural societies. *Asian Bioethics Review*, v. 4, n.4, p. 355-373, 2012.

STRAND, R.; KAISER, M. Report on Ethical Issues Raised by emerging Sciences and Technologies. *Report written for the Council of Europe, Committee of Bioethics, SVT University of Bergen Norwa*y, 2015. Acesso em:

<https://rm.coe.int/CoERMPublicCommonSearchServices/DisplayDCTMContent?documentId=0 90000168030751d>. Acesso em: 18 de mai. 2015.

SUSUKI, Y. et al. Measuring empathy for human and robot hand pain using electroencephaly. *Nature Scientific Report* v.5, n. 15924, 2015.

TAKAYAMA, L. Perspectives on Agency Interaction with and through Personal Robots," In: M. Zacarias, J. de Oliveira (eds). Human-Computer Interaction. The Agency Perspective. Berlin/Heidelberg: Springer, 2013.

THE ECONOMIST. Editing Humanity. The prospect of genetic enhancement, v. 416, n. 4852, 2015.

TINWELL, A. et al. The Uncanny Wall. *Int.J. Arts and Technology*, v.4, n.3, 2011.

YEE, N.; BAILENSON J. The Proteus Effect of Transformed Self-Presentation on Behavior. *Human Communication Research,* v.33, 2007.

_____. *The Proteus Paradox*. How Online Games and Virtual Worlds change us- and how they don´t. Orwigsburg: Yale University Press, 2014.

URNOV, F. et al. Genome editing with Zinc Finger Nucleasis. *Nature Reviews Genetics*, v. 11, 2010.

VON DER PÜTTEN, A. et al. An experimental study on emotional reactions towards a robot. *Int. J. Soc. Robotics* v.5, 2013.

WALDENFELS, B. *Hyperphänomene*. Modi hyperbolischer Erfahrung (=stv 2047). Berlin: Suhrkamp, 2012.

WOLBRING, G. Why NBIC? Why human performance enhancement? *The European Journal of social science research*, v. 21, 2008.

ZETSCHE, B. Cpf1 Is a Single RNA-Guided Endonuclease of a Class 2 CRISPR-Cas System, *Cell*, v.163, n.3, 2015.

GERNER, Alexander. Towards a philosophy of human technology: outlook on cognitive enhancements in avatar/ virtual reality schizophrenia therapy. ***Complexitas - Rev. Fil. Tem.***, Belém, v. 1, n. 1, p. 118-138, jan./jun. 2016. Disponível em:< http://www.periodicos.ufpa.br/index.php/complexitas/article/view/3418>. Acesso em: 04 jul. 2016.